[001] DEVICE FOR CONTROLLING FUNCTIONS OF A MOBILE VEHICLE, AND METHOD FOR CONTROLLING SAID FUNCTIONS

[002]

[003]

[004] The invention relates to a device for controlling the functions of a mobile vehicle and a method for controlling these functions according to the type defined in more detail in the preambles of Claim 1 and Claim 4.

[005]

[006] In mobile vehicles, particularly in work machines such as wheel loaders, there is a need to obtain sufficient power for the hydraulic system even when the service brake is actuated and thus the driving speed is low.

[007] In work machines such as wheel loaders, on one hand, a driving motor drives the driving wheels via a hydrodynamic torque converter and a clutch device and, on the other hand, drives the power-consuming devices, such as hydraulic pumps which, for example, the loading shovel of the wheel loader is operated. Wheel loaders comprise a control function, as a result of which, at the beginning of the loading operation, the driving clutch is opened upon actuation of the service brake, this acts upon the vehicle wheels by disconnecting the hydraulic actuating pressure in a hydraulic, actuated clutch element. As a result of the opening of the driving clutch, the engine power is available almost exclusively to the vehicle hydraulic system for actuating the piston/cylinder arrangement of the loading shovel. Above all, this is associated with the fact that without this control function a very high power loss develops in the torque converter when the drive is connected and the vehicle service brake is actuated, since the turbine wheel in the converter has come to a complete or nearly complete halt, while the pump wheel, driven by the driving motor, rotates at the stall speed.

[008] DE 102 30 993 A1 describes a method for controlling functions of an occupational vehicle, where a driving motor drives vehicle wheels via a driving clutch, and a service brake acts upon the vehicle wheels, and the driving motor drives a hydraulic pump, with the driving clutch between the driving motor and the

driving wheels being automatically opened and the service brake being automatically closed when the load acting upon the driving device of the vehicle, for example the weight of the loader shovel, exceeds a predefined load threshold or is actuated such that DE 102 30 993 A1 describes a method for controlling functions of an occupational vehicle, where a driving motor drives vehicle wheels, via a driving clutch; a service brake acts upon the vehicle wheels, and the driving motor drives a hydraulic pump with the driving clutch between the driving motor and the driving wheels is automatically opened. The service brake is automatically closed when the load acting upon the dirving device of the vheicle, for example, the weight of the loader shovel, exceeds a prederined load threshold or is actuated such that it exceeds this threshold. A wheel loader, however, may encounter a plurality of driving situations in which it is not always desirable to automatically open the service brake and the clutch device with an exceeding load on the working device. For example, if the wheel loader travels up a ramp to the unloading site when feeding a crushing or sorting system, there is a possibility that the wheel loader is slowed down upon actuating the working device, although it has not yet assumed the final position. In the same way, based on the level of dexterity, there is also the possibility that the clutch device is opened when the automatic system is not used, while the service brake has not yet been sufficiently closed resulting in the vehicle rolling down the ramp.

[009] It is the object of the present invention to create a device for controlling the functions of a mobile vehicle and a method for controlling these functions in which a clutch device, which is set between the driving motor and the vehicle wheels, can be opened in order to supply the power-consuming devices with sufficient power and thereby to take the different driving situations of the vehicle into consideration.

[010] The object is achieved with a device that exhibits the characterizing features of the main claim, which is used for controlling the functions of a mobile vehicle, as well as with a method for controlling the functions of a mobile vehicle.

[011]

[012] The driving motor drives a power-consuming device, according to the invention, and, via a clutch device, also the driving wheels. It comprises a means for determining the input torque of the clutch device. The means is configured, for example, as electronic controllers, which with the presence of a hydrodynamic torque converter between the driving motor and the clutch device, use the determined rotational speed information, particularly the pump rotational speed as well as the turbine rotational speed of the hydrodynamic torque converter and the characteristic rotational speed line of the converter to determine the input torque of the clutch device. Additionally, a means is provided for determining the deceleration request, which can be configured, for example, as rotation angle sensors on the brake pedal or as pressure sensors in the brake lines. The clutch device is then opened when a previously defined deceleration request and a previously defined torque have been reached.

[013] In another embodiment, a signal that is proportional to the brake pedal is fed to an electronic controller, which determines the input torque upon recognizing a brake signal; then determines a deceleration request that was previously defined for this input torque, which may correspond, for example, to a defined pedal position and, upon achieving this deceleration request, actuates the clutch device so as to open it. A change of the input torque between the initial actuation of the brake pedal and the time the deceleration request required for opening the clutch device is reached, for example, a sufficient pedal signal, is not taken into consideration.

[014] In another embodiment, the amount of the input torque influences the required deceleration request in order to open the clutch device, for example, upon actuation of the brake pedal, if a high input torque is determined because a wheel loader is driving up a ramp, the clutch device is only opened when a high deceleration request has been reached, which corresponds to an almost completely engaged brake pedal. This ensures that the clutch device does not open too early, i.e., that the service brake is not yet sufficiently closed, since this type of opening would cause the vehicle to roll back if it were located on a ramp.

If a low input torque is determined upon actuation of the service brake, the clutch device opens at a lower deceleration request and thus with a short pedal path of the brake pedal. It is preferable to determine the input torque when the brake pedal has been actuated, however, the service brake has as yet caused no deceleration. By storing the correlation with the required deceleration request in an electronic controller, the clutch device is suitably opened at precisely the correct time for every driving situation.

[015]

[016] Additional characteristics are disclosed in the description of the figures.

[017] The only figure shows a schematic illustration of the method for controlling the function of the mobile vehicle.

[018]

[019] Line 1 shows a determined input torque on a clutch device. Line 2 is a braking pressure acting upon a service brake and thus represents a measure of the vehicle deceleration. Line 3 represents an engaging pressure for the clutch device, wherein at point 4, a clutch device is disengaged, which is evident from a reduced actuating pressure applied on the clutch. For example, if a mobile vehicle is traveling and the brake pedal is actuated, as is shown at point 5, an electronic controller determines the input torque of the clutch unit. If a low torque is determined, as is shown at point 6, the clutch device disengages with a short pedal path, which is evident from line 7. If a high torque is determined, which is evident at point 8, then a distinctly larger pedal path is required in order to disengage the clutch device, which is illustrated with point 9 and line 10. This ensures that with a distinctly higher input torque, the service brake assumes a greater engaging state in order to prevent the vehicle from rolling back as a result of the disengaging of the clutch device.

Reference numerals

1	line
2	line
3	line
4	point
5	point
6	point
7	line
8	point
9	point
10	line